

REMARKS

Some typographic corrections have been introduced as amendments. Some of the rejected claims have been amended. No new matter has been added.

Applicants filed an Information Disclosure Statement under 37 C.F.R. § 1.97 together with form PTO-A820 on December 2, 1999. Applicants note that this form PTO-A820 initialed by the Examiner was not part of the Office Action with a mailing date of February 17, 2000, and further note that it was not part of the Office Action with a mailing date of August 31, 2000. Applicants request that the items listed in the Information Disclosure Statement of December 2, 1999, be considered in the examination of this Application and that form PTO-A820 with its entries initialed by the Examiner be returned to them.

Applicants submit this Amendment "B" and Response for the Examiner's consideration. Reexamination and reconsideration of the application, as amended, in view of the following remarks are respectfully requested.

1. STATUS OF THE CLAIMS

Claims 1-43 were presented for examination; claims 1-43 stand rejected and pending in the application. A nonstatutory double patenting rejection has been asserted against claims 1-43. A terminal disclaimer under 37 C.F.R. § 1.321(c) is enclosed herewith. An objection under 37 C.F.R. § 1.75(d)(1) is traversed. Claims 4, 6 and 23 are rejected under 35 U.S.C. § 112 ¶ 1. These rejections are traversed below. Claims 9-10, 12-13, 26-27, 29-30, and 32-33 stand rejected under 35 U.S.C. § 112 ¶ 2. Some claims are amended, and some of these rejections are traversed below. Claims 1, 6-8, 11, 38, 41, and 43 stand rejected under 35 U.S.C. § 102(e). Some claims are amended, and some of these rejections are traversed below. Claims 2-5, 9-10, 12-13, 14-37, 39-40,

and 42 stand rejected under 35 U.S.C. § 103(a). Some of these claims are amended and some of this rejections are traversed below.

2. RESPONSE TO REJECTIONS

2.1. Objection Under 37 C.F.R. 1.75(d)(1)

The Office Action asserts that a “limitation such as ‘wherein said upper surface for each said isolation trench is formed in an etch process using an etch recipe that etches said first dielectric layer *faster than* said conformal layer and said spacers by a ratio in a range from ... about 1:1 to about 2:1’ fails to get support from [sic] the specification”. Office Action, p. 3, item 2.

As the Office Action points out, the specification provides that a “first preferred selectivity of an etch recipe used in the inventive method is in the range of about 1:1 to about 2:1, selective to isolation film 36 as compared to insulator island 22.” Application, p. 14, *ll.* 18-20. Accordingly, for any ratio greater than 1:1, insulator island 22 is etched faster than isolation film 36.

This interpretation of the term “selective to” is consistent with the interpretation introduced in the Application. By way of illustrative example and not interpretive limitation, the written description provides, *e.g.*, that “an etch recipe that is more selective to the third dielectric layer and the spacer than to the remaining portions of the first dielectric layer.... [A] selectivity that will preferably leave a raised portion of the third dielectric layer extending above the isolation trench while removing substantially all remaining portions of the first dielectric layer.” Application, p. 6, *ll.* 8-12. This example clearly indicates that the term “selective to” stands for “being etched to a lesser extent or slower”, otherwise the third dielectric layer would not be left standing while the first dielectric layer is substantially removed. The specification provides additional passages that illustrate this use of the term “selective to”. *See, e.g.*, Application, p. 11, *ll.* 17-19 and associated figures; p. 15, *ll.* 11-13; p. 17, *ll.* 15-18.

Applicants request the reconsideration and removal of this objection on the basis of the reasoning set forth above.

2.2. Claim Rejections Under 35 U.S.C. § 112 ¶ 1

Dependent claim 4 (which depends from independent claim 1 through dependent claim 2);

Dependent claim 16 (which depends from independent claim 14); and

Dependent claim 23 (which depends from independent claim 18);

stand rejected under 35 U.S.C. § 112 ¶ 1. The Office Action alleges that the rejected claims “contain[] subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention”. Applicants show below that the subject matter recited in these claims is described in the specification.

Claim 4, incorporating language from claim 2 that refers to a liner, recites “wherein forming said liner upon said sidewall of said isolation trench comprises deposition of a composition of matter”. The disclosure in, for example, Application, p. 12, ll. 14-16, provides support to this recitation.

Claim 16, incorporating language from claim 14 that refers to a liner, recites “forming a liner upon a sidewall of each said isolation trench, said liner extending from an interface thereof with said oxide layer to the termination of said isolation trench within said semiconductor substrate; ... wherein said liner is composed of silicon nitride”. Support for the recited composition is found, for example, in Application, p. 12, ll. 18-19, 22-24. Figs. 5A-7A, 5B-7B provide illustrative examples of embodiments of a liner that is referred to in these figures with numeral 30. The recited configuration is supported by the features illustrated in these drawings and by the written description at, for

example, Application, p. 12. In addition, the written description provides, for example, that “[i]nsulation liner 30 may be substantially composed of a nitride such as Si₃N₄, or an equivalent, and can be selectively formed upon sidewall 50 of isolation trench 32.” Application, p. 12, *ll.* 18-19. At least this quoted portion of the written description by itself or in combination with the ordinary skill in the art regarding selective CVD, address the objections set forth in the Office Action regarding claim 16. *See* Office Action, p. 4, item 3.

Concerning the assertion in the Office Action, p. 4, last paragraph, regarding isolation structure 48 shown in Figs. 8A-9A, 9A-9B, Applicants refer to the written description at, for example, Application, p. 15, *ll.* 18-20, 23-24.

Applicants incorporate the applicable reasoning, cites and quotes provided above with respect to claims 4 and 16 to traverse the rejection under 35 U.S.C. § 112 ¶ 1 of claim 23.

Based on the reasons set forth hereinabove, Applicants respectfully submit that claims 4, 16, and 23 comply with 35 U.S.C. § 112 ¶ 1, and reconsideration and withdrawal of this rejection are respectfully requested.

2.3. Claim Rejections Under 35 U.S.C. § 112 ¶ 2

Dependent claims 9-10, 12-13 (which depend from independent claim 7);

Independent claim 26, and dependent claim 27;

Dependent claims 29-30 (which depend from independent claim 28); and

Dependent claims 32-33 (which depends from independent claim 31);

stand rejected under 35 U.S.C. § 112 ¶ 2.

Claims 32-33 have been amended.

Regarding claims 9-10, 12-13, 26-27, and 29-30, Applicants interpret the assertion of insufficient antecedent basis in the claims as referring to the italicized portion of the recitation

quoted in the Office Action. *See* Office Action, p. 5, item 5. To this respect, and also regarding the assertion in the same item of the Office Action that the specification discloses the opposite, Applicants reassert the reasoning and incorporate herein the cites and quotes provided in the foregoing subsection 2.1 concerning the objection under 37 C.F.R. 1.75(d)(1).

For these reasons, Applicants respectfully submit that claims 9-10, 12-13, 26-27, 29-30 and 32-33 comply with 35 U.S.C. § 112 ¶ 2, and reconsideration and withdrawal of these rejections are respectfully requested.

2.4. Claim Rejections Under 35 U.S.C. § 102(e)

The following claims:

Independent claim 1, and dependent claim 6;

Independent claim 7, and dependent claims 8 and 11;

Independent claim 38;

Independent claim 41; and

Independent claim 43;

stand rejected under 35 U.S.C. § 102(e) as being anticipated by Omid-Zohoor, U.S. Pat. No. 6,097,072 (hereinafter “the ‘072 patent”).

The ‘072 patent discloses “a method of suppressing formation of parasitic edge transistors and preventing the thinning of gate oxide at edges of a field effect transistor and an isolating trench of an integrated circuit device”. The ‘072 patent, col. 1, ll. 10-14. This method comprises the steps that are involved in sequentially transforming the structures 3J into 3K, then 3K into 3L, with the subsequent transformation of 3L into 3M. This designation of structures in the ‘072 patent

corresponds to the respective figure numbers given in the same patent. See the '72 patent, Figs. 3J-3M, col. 4, ll. 51-61.

According to the '072 patent, trenches 360 are filled with oxide layer 364 or with an insulating material that conforms to the trenches and to the surface of the rest of the wafer. See the '72 patent, Fig. 3J, col. 4, ll. 47-51. The method disclosed in the '072 patent relies then on the deposition of reverse-resist mask 368 over trench regions 356 (see the '72 patent, Fig. 3K, col. 4, ll. 51-52) to subsequently perform a wet or dry etch to partially remove oxide layer 364 and leave a remaining oxide layer 364 with ridges 373 (see the '72 patent, Fig. 3L, col. 4, ll. 52-54). It is this reduced oxide layer 372 with oxide ridges 373 that is subsequently treated by chemical-mechanical polishing until silicon nitride layer 344 is exposed (see the '72 patent, Fig. 3M, col. 4, ll. 54-57, 59-61). Accordingly, the method disclosed in the '072 patent does not planarize the conformal oxide layer 364 to produce the structure with an upper surface for each isolation trench shown in Fig. 3M therein. Instead, the structure with an upper surface for each isolation trench illustrated in Fig. 3M is obtained according to the '072 patent by chemical-mechanical polishing of the reduced oxide layer 372 that has oxide ridges 373, a structural element which is not the conformal layer 364.

In contrast, claims 1 and 7 recite "planarizing the *conformal layer* ... to form therefrom an upper surface for each said isolation trench that is co-planar to the other said upper surfaces" (italicization added). This recitation is incorporated into claim 6 because it depends from claim 1, and into claims 8 and 11 because they depend from claim 7. Therefore, there is at least one step in the method recited in claims 1, 6-8 and 11 that is not in the process disclosed in the '072 patent.

Because of at least the foregoing recited features in claims 1, 6-8 and 11, the '072 patent does not teach or disclose each and every step of the invention recited in these claims. As stated by the Federal Circuit,

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Anticipation requires the presence in a single prior art reference disclosure of each and every element of the claimed invention, arranged as in the claim.

Lindermann Maschinenfabrik GmbH v. American Hoist & Derrick Co., 730 F.2d 1452, 1458, 221 U.S.P.Q. 481, 485 (Fed. Cir. 1984). Consequently, the '072 patent does not anticipate the invention recited in these claims.

The method disclosed in the '072 patent relies on an etch recipe for the formation of spacers 356 and in another etch recipe for the formation of trenches 360. See the '072 patent, Figs. 3G-3I, col. 4, ll. 37-38, 41-42, 47-49. In contrast, claims 38 and 41 recite “wherein said spacer and said isolation trench are formed with a single etch recipe” (with a minor variation in claim 41). Because of at least the foregoing recited features in claims 38 and 41, the '072 patent does not teach or disclose each and every step of the invention recited in these claims. Applicants incorporate herein the quote to *Lindermann Maschinenfabrik* provided with reference to claims 1, 6-8, and 11. Consequently, the '072 patent does not anticipate the invention recited in claims 38 and 41.

Claim 43 recites “planarizing the *conformal second layer* ... to form a planar upper surface from said *conformal second layer*” (italicization added). Because of at least the foregoing recited features in claim 43, the '072 patent does not teach or disclose each and every step of the invention recited in this claim. Applicants reassert and incorporate with respect to claim 43 the reasoning, cites and quotes provided in the foregoing analysis as applied to claims 1, 6-8, and 11. Consequently, the '072 patent does not anticipate the invention recited in claim 43.

Applicants respectfully submit that claims 1, 6-8, 11, 38, 41, and 43 patentably distinguish over the '072 patent, and reconsideration and withdrawal of this rejection is respectfully requested.

2.5. Claim Rejections Under 35 U.S.C. § 103(a)

The following claims:

Dependent claims 2-5 (which depend from claim 1);

Dependent claims 9-10, and 12-13 (which depend from claim 7);

Independent claim 14, and dependent claims 15-17;

Independent claim 18, and dependent claims 19-23;

Independent claim 24;

Independent claim 25;

Independent claim 26, and dependent claim 27;

Independent claim 28, and dependent claims 29-30;

Independent claim 31, and dependent claims 32-34;

Independent claim 35, and dependent claims 36-37;

Dependent claims 39-40 (which depend from claim 38); and

Independent claim 42;

stand rejected under 35 U.S.C. § 103(a) as obvious over the combination of the '072 patent and at least one of Poon *et al.*, U.S. Pat. No. 5,387,540 (hereinafter "Poon") and Lee *et al.*, U.S. Pat. No. 5,229,316 (hereinafter "Lee"). *See* Office Action, pp. 13-37.

The rejections under 35 U.S.C. § 103(a) rely on the application of the '072 patent as applied in the rejections under 35 U.S.C. § 102, and Poon and/or Lee are cited as providing additional disclosure. All the rejected claims recite explicitly or by incorporation from an independent claim the features in the claimed method that are referred to in the foregoing subsection 2.4. These features concern either the formation of a conformal layer and the subsequent planarization of this conformal layer (claims 2-5, 9-10, 12-13, 14-34, and 42) or the formation of a spacer and an isolation trench

with a single etch recipe (claims 35-37, and 39-40). Applicants incorporate herein the comparison and recitation of features and differences set forth in foregoing subsection 2.4.

Because of the limitations in its teachings, the '072 patent does not teach or suggest the claimed invention. As reasoned above, the claimed method does not rely on the process steps disclosed in the '072 patent. In contrast, the '072 patent relies on different recipes for the spacer etch and for the isolation trench etch, and does not planarize the conformal layer in the presence of spacers, but instead necessitates additional deposition and etching steps. The '072 patent does not disclose or suggest the claimed methods that incorporate the formation of protective spacers with the planarization as described above. Thus, the methods that lead to the solutions provided by the rejected claims would not have been sought by adopting the experiments disclosed in the '072 patent.

Because of differences and limitations such as those described hereinabove, the '072 patent has not suggested the claimed methods, and it may not be asserted that the teachings provided by the '072 patent are sufficient for one of ordinary skill in the art to make the substitutions, combinations or other modifications that are necessary to arrive to the claimed invention.

In addition, the '072 patent does not provide any suggestion or teaching that the claimed invention should have been carried out and would have had a reasonable likelihood of success in light of the process that is disclosed in the '072 patent. To this respect, the Federal Circuit has explained that “[t]he consistent criterion for determination of obviousness is whether the prior art would have suggested to one of ordinary skill in the art that this process should be carried out and would have a reasonable likelihood of success.” (Citations omitted). *Rockwell Int'l Corp. v. United States*, 147 F.3d 1358, 47 U.S.P.Q.2d 1027, 1033 (Fed. Cir. 1998). In addition, “[b]oth the suggestion and the expectation of success must be founded in the prior art, not in applicant’s disclosure.” *In re Dow Chemical Co.*, 837 F.2d 469, 473 (Fed. Cir. 1988).

Furthermore, in light of these differences and limitations in the '072 patent, "a person of ordinary skill, upon reading the reference, would be discouraged from following the path set out in the reference, or would be led in a direction divergent from the path that was taken by the applicant." *United States v. Adams*, 383 U.S. 39, 52 (1966). *See also W.L. Gore & Assocs. v. Garlock, Inc.*, 721 F.2d 1540, 1550-51 (Fed. Cir. 1983), *cert. denied*, 469 U.S. 851 (1984).

Consequently, Applicants respectfully submit that the '072 patent does not support a *prima facie* case of obviousness regarding the rejected claims.

Applicants note that none of the remaining references that are cited in the Office Action in combination with the '072 patent is cited as providing any basis that would overcome the limitations set forth above with respect to the '072 patent. As reasoned above, the '072 patent does not disclose or suggest the claimed methods that incorporate the formation of protective spacers with the planarization as recited in the rejected claims. Therefore, even if the '072 patent could be combined with one or several of the cited references, such combination would not teach or suggest the claimed invention. To this respect Applicants note that it has not been established that the claimed invention as a whole is obvious in light of the cited references because the differences and limitations in the '072 patent are not overcome by any of the remaining cited references. *See* M.P.E.P. § 2141.02, p. 2100-94 (Rev. 1, Feb. 2000). Furthermore, as shown herein, the three basic requirements of a *prima facie* case of obviousness have not been established for the rejected claims in light of the '072 patent or in light of the '072 patent combined with any one of the remaining cited references. These requirements are (a) there must be some suggestion or motivation in the prior art to modify the reference or to combine reference teachings, (b) there must be a reasonable expectation of success in light of the prior art teachings, and (c) the prior art reference or references must teach or suggest all the claim limitations. *See* M.P.E.P. §§ 2142-43, p. 2100-97 (Rev. 1, Feb. 2000).

Regarding the '072 patent and Poon and/or Lee and the lack of any suggestion indicating that a combination of such references would lead to the claimed invention, the Federal Circuit has stated that "[n]othing in the references alone or in combination suggests the claimed invention as a solution to the problem That the claimed invention may employ known principles does not itself establish that the invention would have been obvious." 730 F.2d 1452, 221 U.S.P.Q. 481, 488-89. Furthermore,

Obviousness cannot be established by combining the teaching of the prior art to produce the claimed invention, absent some teaching or suggestion supporting the combination. Under section 103, teachings of references can be combined only if there is some suggestion or incentive to do so. The prior art of record fails to provide any such suggestion or incentive.

ACS Hosp. Sys., Inc. v. Montefiore Hosp., 732 F.2d 1572, 221 U.S.P.Q. 929, 933 (Fed. Cir. 1984). See also M.P.E.P. § 2143.01, pp. 2100-98,99 (citing *In re Mills*, 916 F.2d 680, 16 U.S.P.Q.2d 1430 (Fed. Cir. 1990); *In re Fritch*, 972 F.2d 1260, 23 U.S.P.Q.2d 1780 (Fed. Cir. 1992)); M.P.E.P. § 2145.X.C, p. 2100-122 (Rev. 1, Feb. 2000).

For reasons such as those set forth above, neither the '072 patent nor the '072 patent combined with Poon and/or Lee may render the methods recited in the rejected claims obvious. In addition, it has not been shown that there is a motivation to combine the teachings in the '072 patent with those in Poon and/or Lee and that such combination teaches or suggests the invention recited in any of the rejected claims.

Consequently, Applicant respectfully submits that neither the '072 patent nor any of the cited combinations of the '072 patent with Poon and/or Lee supports a *prima facie* case of obviousness regarding claims 2-5, 9-10, 12-13, 14-37, 39-40, and 42. Applicant respectfully requests the reconsideration and withdrawal of this rejection.

2.6. Claim Rejections Under The Nonstatutory Double Patenting Doctrine

Claims 1-43 stand rejected under the Nonstatutory Double Patenting Doctrine “as being unpatentable over claims 1-43 of U.S. Patent No. 5,953,621”. Office Action, p. 2.

A terminal disclaimer pursuant to 37 C.F.R. § 1.321(c) is enclosed hereto to facilitate the prompt allowance of this case. Filing of this terminal disclaimer is made without prejudice of asserting the substantive legal and procedural standards for traversing an assertion of obviousness under the Nonstatutory Double Patenting Doctrine if Applicants deem appropriate to do so under suitable circumstances.

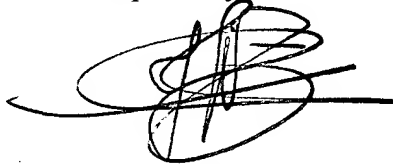
3. **CONCLUSIONS**

In view of the above, Applicants respectfully maintain that the present application is in condition for allowance. Reconsideration of the rejections is requested. Allowance of claims 1-43 at an early date is solicited.

In the event that the Examiner finds any remaining impediment to a prompt allowance of this application which could be clarified by a telephonic interview, or which is susceptible to being overcome by means of an Examiner's Amendment, the Examiner is respectfully requested to initiate the same with the undersigned attorney.

Dated this 29th day of January 2001.

Respectfully submitted,



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